

**WHAT IS CLAIMED IS:**

1. A nucleic acid segment comprising a nucleic acid sequence encoding a 3-ketoacyl-CoA reductase protein, wherein the nucleic acid sequence is selected from the group consisting of:
  - a nucleic acid sequence at least about 80% identical to SEQ ID NO:8;
  - a nucleic acid sequence that hybridizes under stringent conditions to SEQ ID NO:8 or the complement thereof;
  - a nucleic acid sequence encoding a protein at least about 80% identical to SEQ ID NO:9; and
  - a nucleic acid sequence encoding a protein that is immunoreactive with an antibody prepared using SEQ ID NO:9 as an antigen, the antibody being immunoreactive with SEQ ID NO:9.
2. An isolated 3-keto-acyl-CoA reductase protein comprising an amino acid sequence selected from the group consisting of:
  - an amino acid sequence at least about 80% identical to SEQ ID NO:9; and
  - an amino acid sequence that is immunoreactive with an antibody prepared using SEQ ID NO:9 as an antigen, the antibody being immunoreactive with SEQ ID NO:9.
3. A recombinant vector comprising in the 5' to 3' direction:
  - a) a promoter that directs transcription of a structural nucleic acid sequence encoding a 3-keto-acyl-CoA reductase protein;
  - b) a structural nucleic acid sequence encoding a 3-keto-acyl-CoA reductase protein; wherein the structural nucleic acid sequence is selected from the group consisting of:
    - a nucleic acid sequence at least about 80% identical to SEQ ID NO:8;
    - a nucleic acid sequence that hybridizes under stringent conditions to SEQ ID NO:8 or the complement thereof;
    - a nucleic acid sequence encoding a protein at least about 80% identical to SEQ ID NO:9; and
    - a nucleic acid sequence encoding a protein that is immunoreactive with an antibody prepared using SEQ ID NO:9 as an antigen, the antibody being immunoreactive with SEQ ID NO:9; and
  - c) a 3' transcription terminator.
4. A recombinant host cell comprising a nucleic acid segment encoding a 3-ketoacyl-CoA reductase protein, wherein the nucleic acid segment is selected from the group consisting of:
  - a nucleic acid sequence at least about 80% identical to SEQ ID NO:8;
  - a nucleic acid sequence that hybridizes under stringent conditions to SEQ ID NO:8 or the complement thereof;

- a nucleic acid sequence encoding a protein at least about 80% identical to SEQ ID NO:9; and
- a nucleic acid sequence encoding a protein that is immunoreactive with an antibody prepared using SEQ ID NO:9 as an antigen, the antibody being immunoreactive with SEQ ID NO:9.
5. A genetically transformed plant cell comprising in the 5' to 3' direction:
- a) a promoter that directs transcription of a structural nucleic acid sequence encoding a 3-keto-acyl-CoA reductase protein;
  - b) a structural nucleic acid sequence encoding a 3-keto-acyl-CoA reductase protein; wherein the structural nucleic acid sequence is selected from the group consisting of:
    - a nucleic acid sequence at least about 80% identical to SEQ ID NO:8;
    - a nucleic acid sequence that hybridizes under stringent conditions to SEQ ID NO:8 or the complement thereof;
  - c) a nucleic acid sequence encoding a protein at least about 80% identical to SEQ ID NO:9; and
  - d) a nucleic acid sequence encoding a protein that is immunoreactive with an antibody prepared using SEQ ID NO:9 as an antigen, the antibody being immunoreactive with SEQ ID NO:9;
- c) a 3' transcription terminator; and
  - d) a 3' polyadenylation signal sequence that directs the addition of polyadenylate nucleotides to the 3' end of RNA transcribed from the structural nucleic acid sequence.
6. A genetically transformed plant comprising in the 5' to 3' direction:
- a) a promoter that directs transcription of a structural nucleic acid sequence encoding a 3-keto-acyl-CoA reductase protein;
  - b) a structural nucleic acid sequence encoding a 3-keto-acyl-CoA reductase protein; wherein the structural nucleic acid sequence is selected from the group consisting of:
    - a nucleic acid sequence at least about 80% identical to SEQ ID NO:8;
    - a nucleic acid sequence that hybridizes under stringent conditions to SEQ ID NO:8 or the complement thereof;
  - c) a nucleic acid sequence encoding a protein at least about 80% identical to SEQ ID NO:9; and
  - d) a nucleic acid sequence encoding a protein that is immunoreactive with an antibody prepared using SEQ ID NO:9 as an antigen, the antibody being immunoreactive with SEQ ID NO:9;
- c) a 3' transcription terminator; and
  - d) a 3' polyadenylation signal sequence that directs the addition of polyadenylate nucleotides to the 3' end of RNA transcribed from the structural nucleic acid sequence.

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7. A method of preparing host cells useful to produce a 3-keto-acyl-CoA reductase protein, the method comprising:
    - a) selecting a host cell;
    - b) transforming the selected host cell with a recombinant vector having a structural nucleic acid sequence encoding a 3-keto-acyl-CoA reductase protein, wherein the structural nucleic acid sequence is selected from the group consisting of:  
a nucleic acid sequence at least about 80% identical to SEQ ID NO:8;  
a nucleic acid sequence that hybridizes under stringent conditions to SEQ ID NO:8 or the complement thereof;  
a nucleic acid sequence encoding a protein at least about 80% identical to SEQ ID NO:9; and  
a nucleic acid sequence encoding a protein that is immunoreactive with an antibody prepared using SEQ ID NO:9 as an antigen, the antibody being immunoreactive with SEQ ID NO:9; and
    - c) obtaining transformed host cells.
  8. A method of preparing plants useful to produce a 3-keto-acyl-CoA reductase protein, the method comprising:
    - a) selecting a host plant cell;
    - b) transforming the selected host plant cell with a recombinant vector having a structural nucleic acid sequence encoding a 3-keto-acyl-CoA reductase protein, wherein the structural nucleic acid sequence is selected from the group consisting of:  
a nucleic acid sequence at least about 80% identical to SEQ ID NO:8;  
a nucleic acid sequence that hybridizes under stringent conditions to SEQ ID NO:8 or the complement thereof;  
a nucleic acid sequence encoding a protein at least about 80% identical to SEQ ID NO:9; and  
a nucleic acid sequence encoding a protein that is immunoreactive with an antibody prepared using SEQ ID NO:9 as an antigen, the antibody being immunoreactive with SEQ ID NO:9;
    - c) obtaining transformed host plant cells; and
    - d) regenerating the transformed host plant cells.
  9. A nucleic acid segment comprising a nucleic acid sequence encoding a polyhydroxyalkanoate synthase protein, wherein the nucleic acid sequence is selected from the group consisting of:  
a nucleic acid sequence at least about 80% identical to SEQ ID NO:10;  
a nucleic acid sequence that hybridizes under stringent conditions to SEQ ID NO:10 or the complement thereof;  
a nucleic acid sequence encoding a protein at least about 80% identical to SEQ ID NO:11; and

- a nucleic acid sequence encoding a protein that is immunoreactive with an antibody prepared using SEQ ID NO:11 as an antigen, the antibody being immunoreactive with SEQ ID NO:11.
10. An isolated polyhydroxyalkanoate synthase protein comprising an amino acid sequence selected from the group consisting of:  
an amino acid sequence at least about 80% identical to SEQ ID NO:11; and  
an amino acid sequence that is immunoreactive with an antibody prepared using SEQ ID NO:11 as an antigen, the antibody being immunoreactive with SEQ ID NO:11.
11. A recombinant vector comprising in the 5' to 3' direction:  
a) a promoter that directs transcription of a structural nucleic acid sequence encoding a polyhydroxyalkanoate synthase protein;  
b) a structural nucleic acid sequence encoding a polyhydroxyalkanoate synthase protein; wherein the structural nucleic acid sequence is selected from the group consisting of:  
a nucleic acid sequence at least about 80% identical to SEQ ID NO:10;  
a nucleic acid sequence that hybridizes under stringent conditions to SEQ ID NO:10 or the complement thereof;  
a nucleic acid sequence encoding a protein at least about 80% identical to SEQ ID NO:11; and  
a nucleic acid sequence encoding a protein that is immunoreactive with an antibody prepared using SEQ ID NO:11 as an antigen, the antibody being immunoreactive with SEQ ID NO:11; and  
c) a 3' transcription terminator.
12. A recombinant host cell comprising a nucleic acid segment encoding a polyhydroxyalkanoate synthase protein, wherein the nucleic acid segment is selected from the group consisting of:  
a nucleic acid sequence at least about 80% identical to SEQ ID NO:10;  
a nucleic acid sequence that hybridizes under stringent conditions to SEQ ID NO:10 or the complement thereof;  
a nucleic acid sequence encoding a protein at least about 80% identical to SEQ ID NO:11; and  
a nucleic acid sequence encoding a protein that is immunoreactive with an antibody prepared using SEQ ID NO:11 as an antigen, the antibody being immunoreactive with SEQ ID NO:11.
13. A genetically transformed plant cell comprising in the 5' to 3' direction:  
a) a promoter that directs transcription of a structural nucleic acid sequence encoding a polyhydroxyalkanoate synthase protein;

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- b) a structural nucleic acid sequence encoding a polyhydroxyalkanoate synthase protein; wherein the structural nucleic acid sequence is selected from the group consisting of:  
a nucleic acid sequence at least about 80% identical to SEQ ID NO:10;  
a nucleic acid sequence that hybridizes under stringent conditions to SEQ ID NO:10 or the complement thereof;  
a nucleic acid sequence encoding a protein at least about 80% identical to SEQ ID NO:11; and  
a nucleic acid sequence encoding a protein that is immunoreactive with an antibody prepared using SEQ ID NO:11 as an antigen, the antibody being immunoreactive with SEQ ID NO:11;
- c) a 3' transcription terminator; and
- d) a 3' polyadenylation signal sequence that directs the addition of polyadenylate nucleotides to the 3' end of RNA transcribed from the structural nucleic acid sequence.
14. A genetically transformed plant comprising in the 5' to 3' direction:  
a) a promoter that directs transcription of a structural nucleic acid sequence encoding a polyhydroxyalkanoate synthase protein;  
b) a structural nucleic acid sequence encoding a polyhydroxyalkanoate synthase protein; wherein the structural nucleic acid sequence is selected from the group consisting of:  
a nucleic acid sequence at least about 80% identical to SEQ ID NO:10;  
a nucleic acid sequence that hybridizes under stringent conditions to SEQ ID NO:10 or the complement thereof;  
a nucleic acid sequence encoding a protein at least about 80% identical to SEQ ID NO:11; and  
a nucleic acid sequence encoding a protein that is immunoreactive with an antibody prepared using SEQ ID NO:11 as an antigen, the antibody being immunoreactive with SEQ ID NO:11;
- c) a 3' transcription terminator; and
- d) a 3' polyadenylation signal sequence that directs the addition of polyadenylate nucleotides to the 3' end of RNA transcribed from the structural nucleic acid sequence.
15. A method of preparing host cells useful to produce a polyhydroxyalkanoate synthase protein, the method comprising:  
a) selecting a host cell;  
b) transforming the selected host cell with a recombinant vector having a structural nucleic acid sequence encoding a polyhydroxyalkanoate synthase protein, wherein the structural nucleic acid sequence is selected from the group consisting of:  
a nucleic acid sequence at least about 80% identical to SEQ ID NO:10;

- a nucleic acid sequence that hybridizes under stringent conditions to SEQ ID NO:10 or the complement thereof;
- a nucleic acid sequence encoding a protein at least about 80% identical to SEQ ID NO:11; and
- a nucleic acid sequence encoding a protein that is immunoreactive with an antibody prepared using SEQ ID NO:11 as an antigen, the antibody being immunoreactive with SEQ ID NO:11; and
- c) obtaining transformed host cells.
16. A method of preparing plants useful to produce a polyhydroxyalkanoate synthase protein, the method comprising:
- a) selecting a host plant cell;
- b) transforming the selected host plant cell with a recombinant vector having a structural nucleic acid sequence encoding a polyhydroxyalkanoate synthase protein, wherein the structural nucleic acid sequence is selected from the group consisting of:
- a nucleic acid sequence at least about 80% identical to SEQ ID NO:10;
- a nucleic acid sequence that hybridizes under stringent conditions to SEQ ID NO:10 or the complement thereof;
- a nucleic acid sequence encoding a protein at least about 80% identical to SEQ ID NO:11; and
- a nucleic acid sequence encoding a protein that is immunoreactive with an antibody prepared using SEQ ID NO:11 as an antigen, the antibody being immunoreactive with SEQ ID NO:11;
- c) obtaining transformed host plant cells; and
- d) regenerating the transformed host plant cells.
17. A method for the preparation of polyhydroxyalkanoate, the method comprising:
- a) obtaining a cell comprising:
- a nucleic acid sequence encoding a 3-keto-acyl-CoA reductase protein;
- and
- a nucleic acid sequence encoding a PHA synthase protein;
- wherein:
- the nucleic acid sequence encoding a 3-keto-acyl-CoA reductase protein is not naturally found in the cell;
- the nucleic acid sequence encoding a PHA synthase protein is not naturally found in the cell;
- the nucleic acid sequence encoding a 3-keto-acyl-CoA reductase protein is selected from the group consisting of:
- a nucleic acid sequence at least about 80% identical to SEQ ID NO:8;
- a nucleic acid sequence that hybridizes under stringent conditions to SEQ ID NO:8 or the complement thereof;

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- a nucleic acid sequence encoding a protein at least about 80% identical to SEQ ID NO:9; and  
a nucleic acid sequence encoding a protein that is immunoreactive with an antibody prepared using SEQ ID NO:9 as an antigen, the antibody being immunoreactive with SEQ ID NO:9; and  
the nucleic acid sequence encoding a PHA synthase protein is selected from the group consisting of:  
a nucleic acid sequence at least about 80% identical to SEQ ID NO:10;  
a nucleic acid sequence that hybridizes under stringent conditions to SEQ ID NO:10 or the complement thereof;  
a nucleic acid sequence encoding a protein at least about 80% identical to SEQ ID NO:11; and  
a nucleic acid sequence encoding a protein that is immunoreactive with an antibody prepared using SEQ ID NO:11 as an antigen, the antibody being immunoreactive with SEQ ID NO:11; and
- b) culturing the cell under conditions suitable for the preparation of polyhydroxyalkanoate.
18. A method for the preparation of polyhydroxyalkanoate, the method comprising:
- a) obtaining a plant comprising:  
a nucleic acid sequence encoding a 3-keto-acyl-CoA reductase protein;  
and  
a nucleic acid sequence encoding a PHA synthase protein;  
wherein:  
the nucleic acid sequence encoding a 3-keto-acyl-CoA reductase protein is not naturally found in the plant;  
the nucleic acid sequence encoding a PHA synthase protein is not naturally found in the plant;  
the nucleic acid sequence encoding a 3-keto-acyl-CoA reductase protein is selected from the group consisting of:  
a nucleic acid sequence at least about 80% identical to SEQ ID NO:8;  
a nucleic acid sequence that hybridizes under stringent conditions to SEQ ID NO:8 or the complement thereof;  
a nucleic acid sequence encoding a protein at least about 80% identical to SEQ ID NO:9; and  
a nucleic acid sequence encoding a protein that is immunoreactive with an antibody prepared using

- SEQ ID NO:9 as an antigen, the antibody being immunoreactive with SEQ ID NO:9; and  
the nucleic acid sequence encoding a PHA synthase protein is selected from the group consisting of:  
a nucleic acid sequence at least about 80% identical to SEQ ID NO:10;  
a nucleic acid sequence that hybridizes under stringent conditions to SEQ ID NO:10 or the complement thereof;  
a nucleic acid sequence encoding a protein at least about 80% identical to SEQ ID NO:11; and  
a nucleic acid sequence encoding a protein that is immunoreactive with an antibody prepared using SEQ ID NO:11 as an antigen, the antibody being immunoreactive with SEQ ID NO:11; and
- b) growing the plant under conditions suitable for the preparation of polyhydroxyalkanoate.
19. A method for the preparation of polyhydroxyalkanoate, the method comprising:
- a) obtaining a cell comprising:  
a nucleic acid sequence encoding a 3-keto-acyl-CoA reductase protein;  
and  
a nucleic acid sequence encoding a PHA synthase protein;  
wherein:  
the nucleic acid sequence encoding a 3-keto-acyl-CoA reductase protein is not naturally found in the cell;  
the nucleic acid sequence encoding a 3-keto-acyl-CoA reductase protein is selected from the group consisting of:  
a nucleic acid sequence at least about 80% identical to SEQ ID NO:8;  
a nucleic acid sequence that hybridizes under stringent conditions to SEQ ID NO:8 or the complement thereof;  
a nucleic acid sequence encoding a protein at least about 80% identical to SEQ ID NO:9; and  
a nucleic acid sequence encoding a protein that is immunoreactive with an antibody prepared using SEQ ID NO:9 as an antigen, the antibody being immunoreactive with SEQ ID NO:9; and
- b) culturing the cell under conditions suitable for the preparation of polyhydroxyalkanoate.
20. A method for the preparation of polyhydroxyalkanoate, the method comprising:
- a) obtaining a plant comprising:

- a nucleic acid sequence encoding a 3-keto-acyl-CoA reductase protein;  
and  
a nucleic acid sequence encoding a PHA synthase protein;  
wherein:
- the nucleic acid sequence encoding a 3-keto-acyl-CoA reductase protein is not naturally found in the plant;  
the nucleic acid sequence encoding a 3-keto-acyl-CoA reductase protein is selected from the group consisting of:  
a nucleic acid sequence at least about 80% identical to SEQ ID NO:8;  
a nucleic acid sequence that hybridizes under stringent conditions to SEQ ID NO:8 or the complement thereof;  
a nucleic acid sequence encoding a protein at least about 80% identical to SEQ ID NO:9; and  
a nucleic acid sequence encoding a protein that is immunoreactive with an antibody prepared using SEQ ID NO:9 as an antigen, the antibody being immunoreactive with SEQ ID NO:9; and
- b) growing the plant under conditions suitable for the preparation of polyhydroxyalkanoate.
21. A method for the preparation of polyhydroxyalkanoate, the method comprising:
- a) obtaining a cell comprising:
- a nucleic acid sequence encoding a 3-keto-acyl-CoA reductase protein;  
and  
a nucleic acid sequence encoding a PHA synthase protein;  
wherein:
- the nucleic acid sequence encoding a PHA synthase protein is not naturally found in the cell;  
the nucleic acid sequence encoding a PHA synthase protein is selected from the group consisting of:  
a nucleic acid sequence at least about 80% identical to SEQ ID NO:10;  
a nucleic acid sequence that hybridizes under stringent conditions to SEQ ID NO:10 or the complement thereof;  
a nucleic acid sequence encoding a protein at least about 80% identical to SEQ ID NO:11; and  
a nucleic acid sequence encoding a protein that is immunoreactive with an antibody prepared using SEQ ID NO:11 as an antigen, the antibody being immunoreactive with SEQ ID NO:11; and

- b) culturing the cell under conditions suitable for the preparation of polyhydroxyalkanoate.
22. A method for the preparation of polyhydroxyalkanoate, the method comprising:
- a) obtaining a plant comprising:
- a nucleic acid sequence encoding a 3-keto-acyl-CoA reductase protein;  
and  
a nucleic acid sequence encoding a PHA synthase protein;  
wherein:
- the nucleic acid sequence encoding a PHA synthase protein is not naturally found in the plant;
- the nucleic acid sequence encoding a PHA synthase protein is selected from the group consisting of:
- a nucleic acid sequence at least about 80% identical to SEQ ID NO:10;  
a nucleic acid sequence that hybridizes under stringent conditions to SEQ ID NO:10 or the complement thereof;  
a nucleic acid sequence encoding a protein at least about 80% identical to SEQ ID NO:11; and  
a nucleic acid sequence encoding a protein that is immunoreactive with an antibody prepared using SEQ ID NO:11 as an antigen, the antibody being immunoreactive with SEQ ID NO:11; and
- b) growing the plant under conditions suitable for the preparation of polyhydroxyalkanoate.
23. A method for the preparation of polyhydroxyalkanoate, the method comprising:
- a) obtaining a recombinant host cell comprising:
- a nucleic acid sequence encoding a  $\beta$ -ketothiolase protein;  
a nucleic acid sequence encoding a 3-ketoacyl-CoA reductase protein;  
a nucleic acid sequence encoding a polyhydroxyalkanoate synthase protein;  
a nucleic acid sequence encoding a  $\beta$ -hydroxyacyl-CoA dehydrase; and  
a nucleic acid sequence encoding an acyl-CoA dehydrogenase protein or an enoyl-CoA reductase protein; and
- b) culturing the recombinant host cell under conditions suitable for the preparation of polyhydroxyalkanoate; wherein:
- the polyhydroxyalkanoate comprises C6, C8, or C10 monomer subunits;
- the nucleic acid sequence encoding a 3-keto-acyl-CoA reductase protein is selected from the group consisting of:
- a nucleic acid sequence at least about 80% identical to SEQ ID NO:8;

a nucleic acid sequence that hybridizes under stringent conditions  
to SEQ ID NO:8 or the complement thereof;  
a nucleic acid sequence encoding a protein at least about 80%  
identical to SEQ ID NO:9; and  
a nucleic acid sequence encoding a protein that is immunoreactive  
with an antibody prepared using SEQ ID NO:9 as an  
antigen, the antibody being immunoreactive with SEQ ID  
NO:9.

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